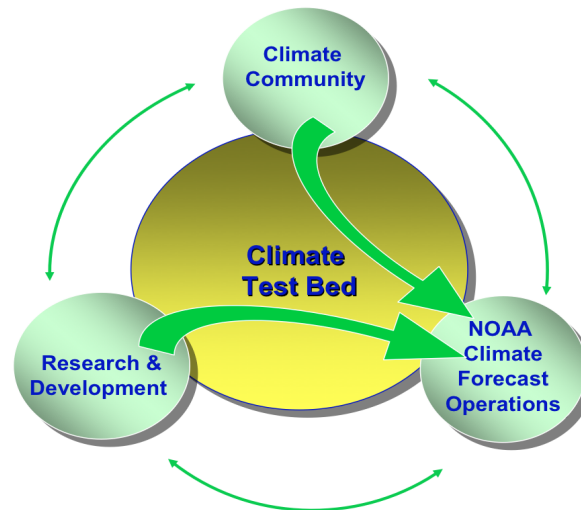




NOAA Climate Test Bed (CTB) -- Accelerating R2O Transition --

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May 7, 2015



What is CTB? How does CTB operate? What's new? How do I get involved?

Purpose of the Presentation: To help the external research community and NCEP scientists become familiar with CTB drivers, process and requirements.

Outline:

Part I: Overview

- Mission, scope, priorities
- Ongoing projects

Part II: Opportunities, process and requirements

- MAPP–CTB opportunities/requirements
- Proposal writing and review process
- Project execution and review

Part I: Overview

Mission Driver

“Strengthen the integration, alignment, and effectiveness of research and development that supports NOAA's operational missions, including accelerating the transition of research advances to applications”

NOAA Annual Guidance Memorandum for Fiscal Year 2015

NOAA's Mission Drivers for Climate

COMMERCE



COASTS



RECREATION



ECOSYSTEMS

RESPONDING TO THE NEED FOR CLIMATE INFORMATION ACROSS ALL SECTORS OF OUR ECONOMY DRIVING NEW OPERATIONAL PRODUCTS & APPLICATIONS

FARMING



HYDROPOWER



HEALTH

PRIVATE SECTOR





NCEP Test Beds

Service–Science Linkage with the Outside Community: Accelerating the R2O Transition Process



- EMC WRF Developmental Test Center (DTC)
Joint Center for Satellite Data Assimilation
- **CPC Climate Test Bed**
- NHC Joint Hurricane Test Bed
- HPC Hydrometeorological Test Bed
- SPC Hazardous Weather Test Bed with NSSL
- SWPC Space Weather Prediction Test Bed with AFWA
- AWC Aviation Weather Test Bed
- OPC IOOS Supported Test Bed (in discussion
with NOS/IOOS)

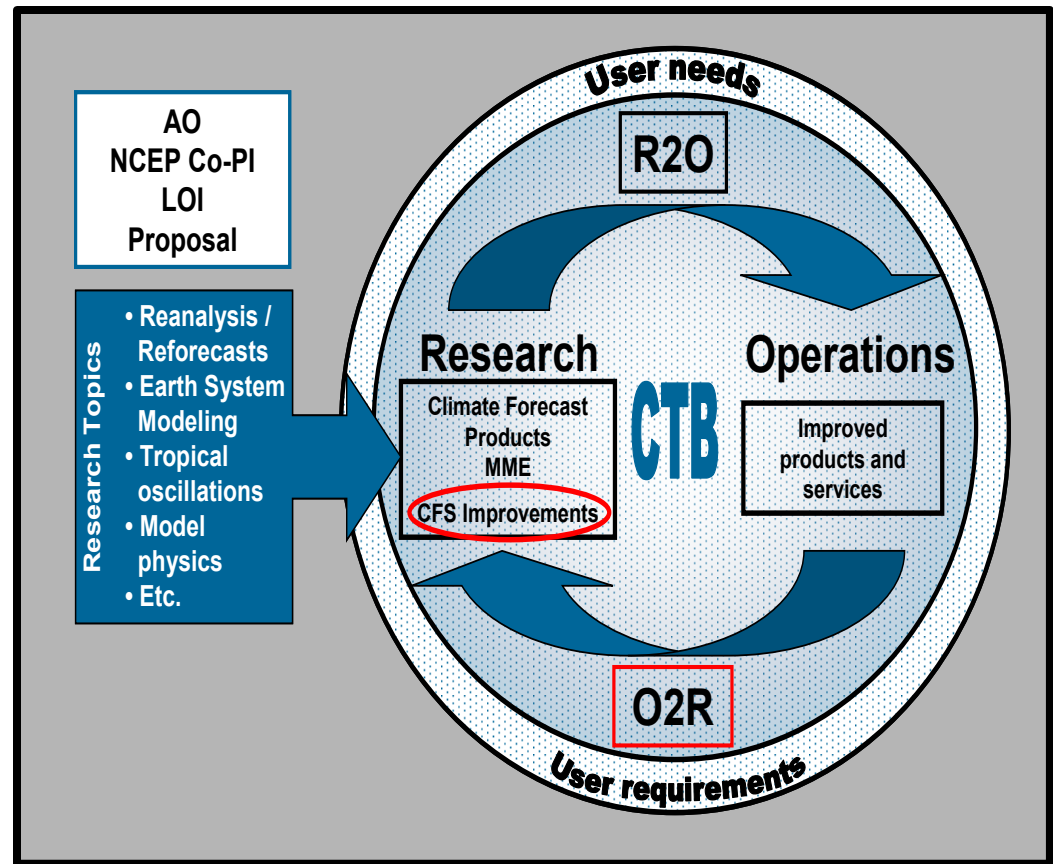


**Organization structure,
scope and funding
sources are different
for different test beds**

NOAA Climate Test Bed: Goals

Mission: Advancing operational climate monitoring, models, and prediction capabilities

- Accelerate **research-to-operations (R2O)** transition to improve NCEP operational climate prediction
- Provide **operations-to-research (O2R)** support to the climate research community with access to operational models, forecast tools and datasets



<http://www.cpc.ncep.noaa.gov/products/ctb/>

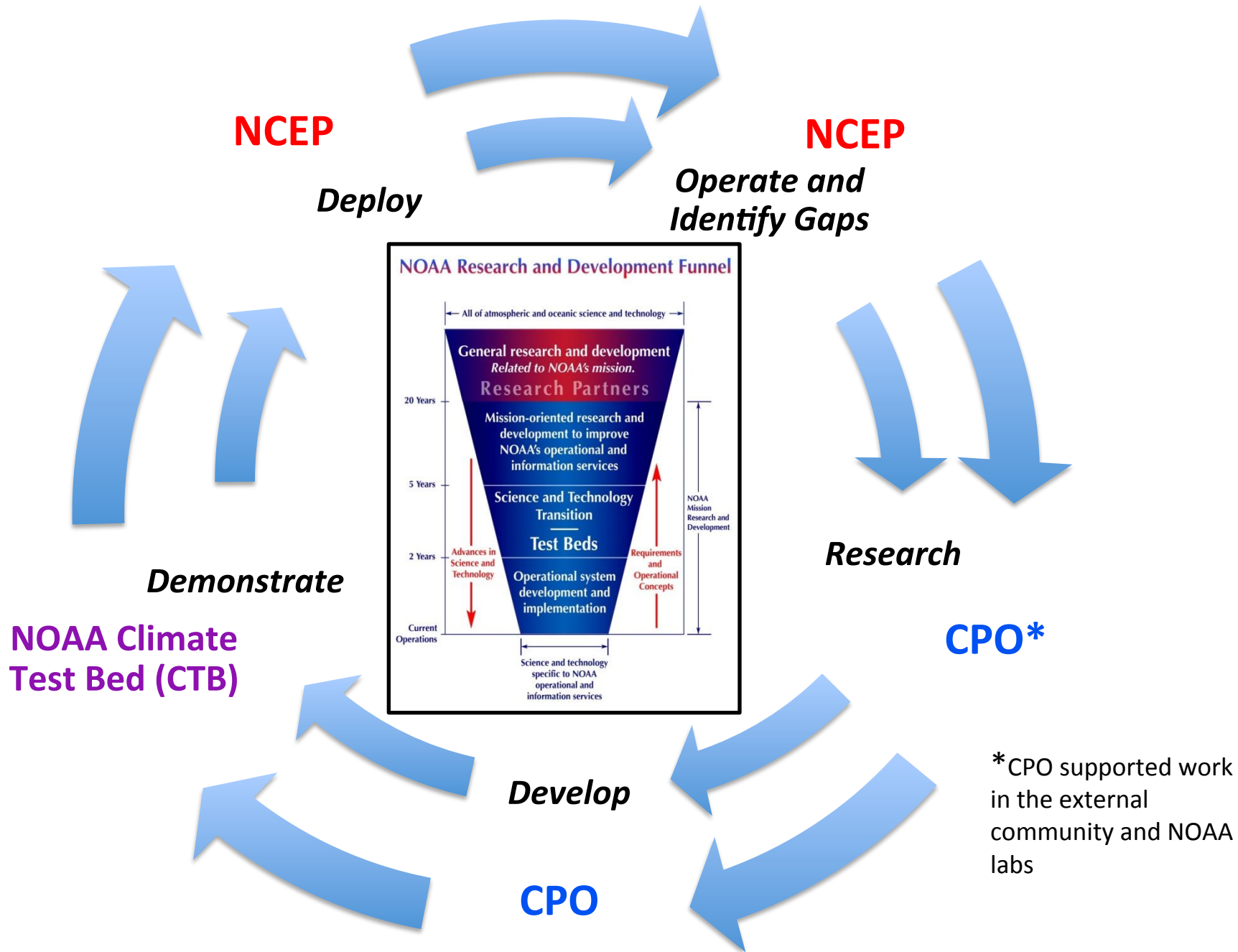
NOAA CTB: Organization and Priorities

- A joint effort of NWS/NCEP and Office of Oceanic and Atmospheric (OAR)/Climate Program Office (CPO)
 - NCEP employees
 - Grants projects funded by CPO/MAPP Program
- A CTB Science Advisory Board
- Established: 2005

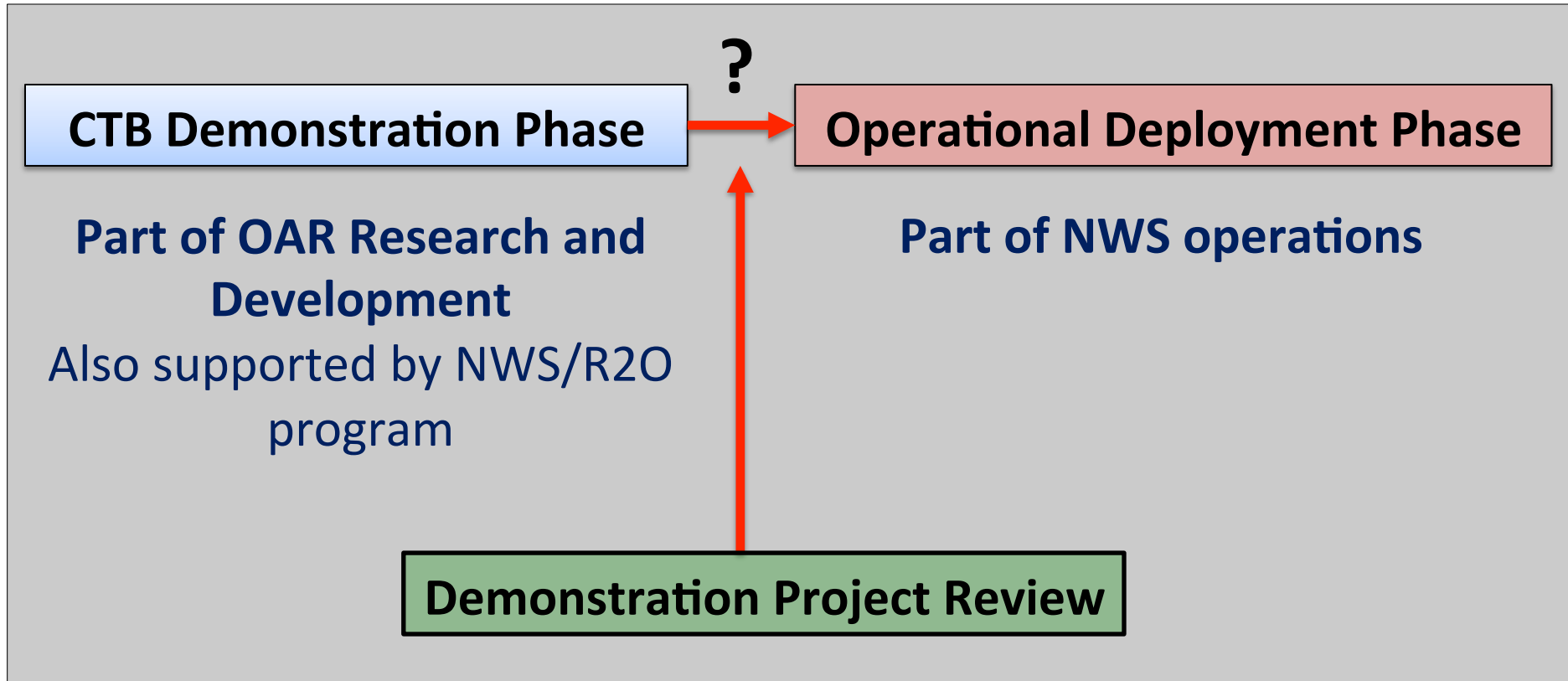
Climate Test Bed Priorities:

1. Multi-model ensembles
2. Climate Forecast System (CFS) improvements
3. Climate forecast products
4. Climate-quality reanalysis

CTB Transition: A Mission-Driven Process



Two Phases for CTB Transition



- Climate Test Bed: a prime example of OAR–NWS partnership in R2O/O2R

Climate Test Bed Priority 1

Goal: To improve intraseasonal to interannual predictions based on ensemble of models augmenting CFS predictions

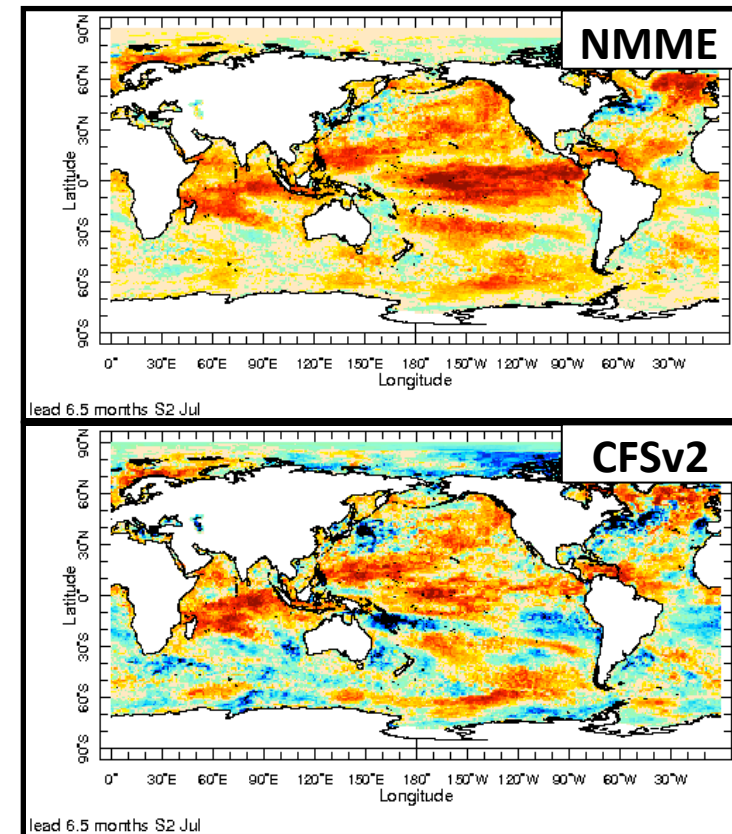
Project in transition during FY15: Seasonal North American Multi-Model Ensemble

What was tested: A prediction system based on major climate models in U.S. and Canada for NCEP operational seasonal forecasts

How it was tested: Tests based on 30-year hindcasts and real-time forecasts since Aug 2011

What was demonstrated: Improved forecast reliability and forecast skill

Impact: (1) Improved numerical guidance for CPC operational seasonal forecasts; (2) the most comprehensive seasonal prediction dataset publically available for research and applications



Ranked probability skill scores of 6.5-month sea surface temperature forecasts

Climate Test Bed Priority 2

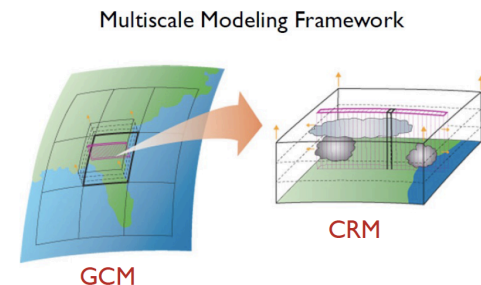
Goal: To accelerate evaluation of and improvements to the operational Climate Forecast System (CFS) and to enhance its use as a skillful tool in providing NCEP's climate predictions and applications

5 ongoing modeling projects to test new parameterizations and schemes for use in CFS:

1. **Cloud-CPT 1** PI: Krueger, EMC Co-PI: Moorthi
2. **Cloud-CPT 2** PI: Bretherton, EMC Co-PIs: Jongil Han and Rui-Yu Sun
3. **Lake Module** PI: Jin J, EMC Co-PIs: Ek and Wu
4. **Land Module** PI: Chen, EMC Co-PIs: Ek, Yang and Meng
5. **Aerosol Module** PI: Lu, EMC Co-PI: Hou YT, Co-I Moorthi



Images courtesy of S. Krueger



Climate Test Bed Priority 3

Goal: To provide reliable climate forecast products that are responsive to the needs of users and incorporate state-of-the-art science and research

4 ongoing projects on testing of prediction tools and new products:

1. Week-3 and Week-4 Forecast Tools

PI: Xie/Johnson, CPC Co-Pis: L'Heureux and Baxter

2. Extended Range Severe Weather Forecast Tools

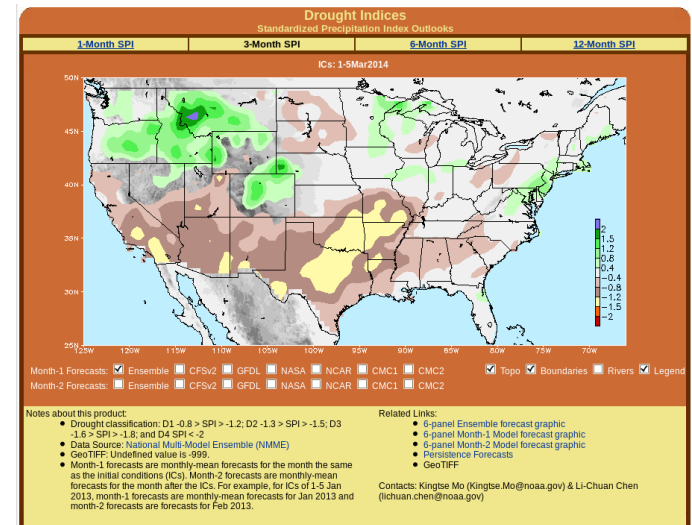
PI: Tippett, CPC Co-PI: Gottschalck, SPC Co-PI: Carbin

3. NMME Prediction Post-processing Protocol

PI: Del Sole, CPC Co-PI: Kumar

4. Probabilistic NMME Products

PI: Barnston, CPC Co-PIs: van Den Dool and Becker



North American Multi-Model-based Seasonal Drought Outlook

Climate Test Bed Priority 4

Goal: Accelerate the transition of data assimilation schemes and methodologies to improve climate quality reanalysis

New area:

Currently no ongoing CTB projects

Part II: Opportunities, Process and Engagement

MAPP Program Research Goals

Advance understanding and prediction of variability and changes in Earth's climate system and infuse research advances into NOAA's service activities

Prediction week-2 to interannual

Climate and Earth System Models

Drought Research

Long-Term Climate Outlooks

Climate Reanalysis

- The MAPP Program, as part of OAR/CPO, provides competitive opportunities
- Supports climate R&D and transition
- Involves the external community in support of NOAA's mission

Outcomes of MAPP transition projects documented online at <http://cpo.noaa.gov/MAPP/R2A>

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CLIMATE PROGRAM OFFICE

Advancing scientific understanding of climate, improving society's ability to plan and respond

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Research to Applications

Improving operations and informing applied work through research to address societal challenges



Drought and Water Resource Challenges



Extreme Weather and Climate Variability



Sustaining Marine Resources



Sea Level Rise and Coastal Flooding

Listed below are R2A projects that have successfully completed transition to application in the time frame of January 1, 2013 to July 31, 2014.

[Click to expand](#) each project for more details

Project Name: [North American Multi-Model Ensemble](#)

DATE COMPLETED: Monthly
APPLICATION AREA(S): Climate Prediction, Extremes, Drought



Project Name: [Changes in Intraseasonal to Interannual Variability of the Pan American Monsoons Under a Warmer Climate and Their Impacts on Extreme Events as Assessed by the CMIP5 Models and Observations](#)

DATE COMPLETED: September 2014
APPLICATION AREA(S): Extremes, Preparing for 21st century climate





MAPP

Modeling, Analysis, Predictions, and Projections

The Modeling, Analysis, Predictions, and Projections (MAPP) Program's mission is to enhance the Nation's capability to understand and predict natural variability and changes in Earth's climate system. The MAPP Program supports development of advanced climate modeling technologies to improve simulation of climate variability, prediction of future climate variations from weeks to decades, and projection of long-term future climate conditions. To achieve its mission, the MAPP Program supports research focused on the coupling, integration, and application of Earth system models and analyses across NOAA, among partner agencies, and with the external research community.

[Learn more...](#)

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Upcoming Events

MAPP Program Opportunities for CTB



- The MAPP research program provides competitive opportunities to perform transition research as part of CTB
- Last MAPP–CTB proposal solicitation in Fiscal Year 2014 selected 7 projects
- Typically, proposal solicitations are published on the CPO website* and Grants.gov during the summer
- Submission process includes a letter of intent (LOI) potentially followed by a full proposal

*<http://cpo.noaa.gov/>

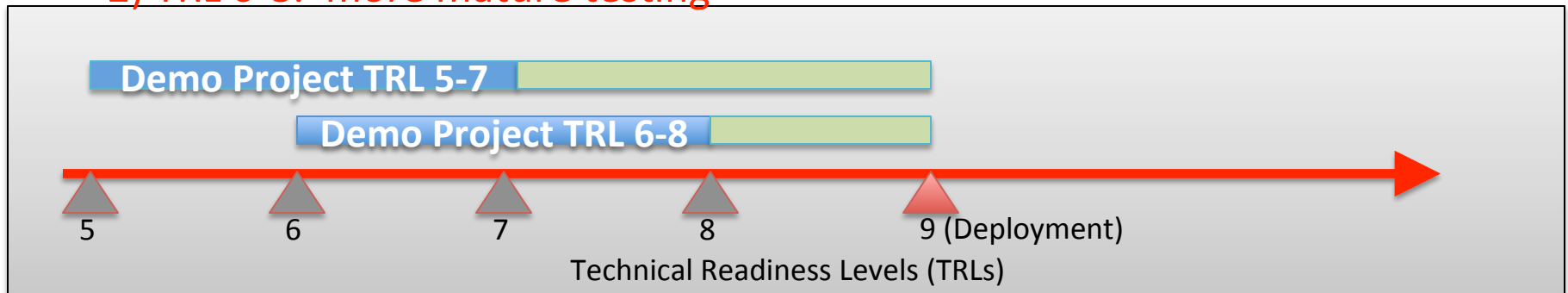
General Requirements for MAPP–CTB Demonstration Projects:

- High relevance to solicitation priorities and to NCEP
- Must involve an NCEP co-PI or collaborator (contact Jin Huang to make a connection with NCEP)
- Clear testing objectives and metrics (what will be tested for transition into NCEP and how)
- Transition for “Technical Readiness Levels” (TRL) 5–8
- Feasibility and support from NCEP
- Must include a transition plan, for both demonstration and potential operational deployment at a later stage

Demonstration projects at different TRL, all need to show a pathway to operations

1) TRL 5-7: early state testing and more risky

2) TRL 6-8: more mature testing



What is the Technical Readiness Level?

Mission Function	TRL #	Technical Readiness Level Definition
Research	1	Basic principles observed and reported
	2	Technology concept and/or application formulated
Development	3	Analytical and experimental critical function and/or characteristic proof-of-concept
	4	Component/subsystem validation in laboratory environment
	5	System/subsystem/component validation in relevant environment
Demonstration	6	System/subsystem model or prototyping demonstration in a relevant end-to-end environment
	7	System prototyping demonstration in an operational environment
	8	Actual system completed and "mission qualified" through test and demonstration in an operational environment
Deployment	9	Actual system "mission proven" through successful mission operations

What is a Transition Plan?

A two-part plan that illustrates both the demonstration activities and potential operational deployment; to be submitted with proposal

Demonstration Phase Plan:

- What would be deployed operationally as a result of this research
- Metrics for measuring the success of the demonstration phase
- Tasks, deliverables and timeline
- Costs to OAR
- NOAA HPC requirements during demonstration (if any)

Deployment Phase Plan:

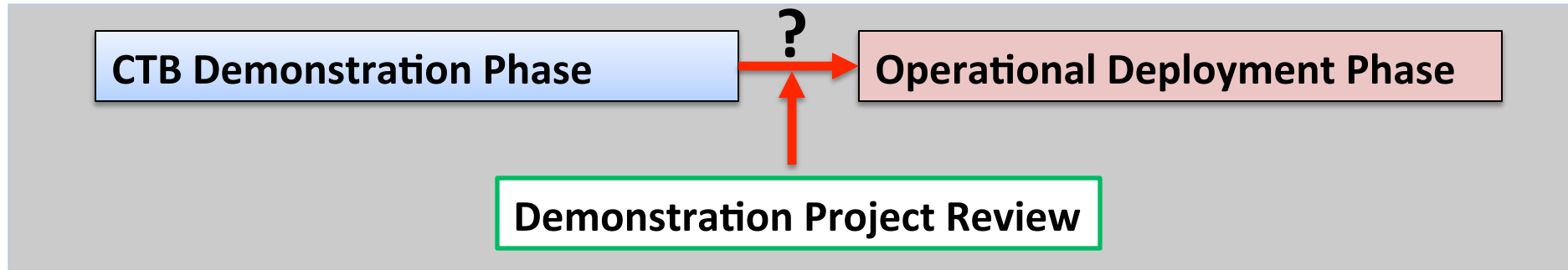
- Tasks and timeline for deployment
- Cost to NWS for deployment (if any)
- HPC requirements during deployment (if any)

Signatures of the NWS AA and the OAR AA or their representatives

MAPP–CTB Proposal Preparation Process

- External community PIs and NCEP co-PIs interact on LOI ideas.
- NCEP management provides guidance and feedback to NCEP co-PIs on the preparation of the LOIs.
- CPO provides feedback to the LOIs regarding the submission of a full proposal as stated in solicitation.
- NCEP management provides feedback to NCEP co-PIs on transition plans before full proposals are submitted to CPO for peer review in terms of relevance to NCEP operational priorities and NWS commitment
- Transition plans signed by NWS AA or designee are included in the full proposals before they are submitted for CPO peer review

Post-Project Project Review and Potential Operational Deployment



- Post-Project Review: 90 days after end of project
 - Assesses whether the demonstration activities were executed according to plan
 - Assesses the outcome of tests that were executed and whether operational deployment is recommended: has an advancement in technical readiness of methodology/model component been proven? Has the TRL 8 level been reached? Is new methodology better than operational benchmark?
- NCEP will consider outcome of review and make a decision on whether to deploy operationally
 - Operational deployment plan is put in place conditional on NCEP's decision

Many Opportunities for MAPP–CTB Engagement during Project Execution

- MAPP Program Task Forces involving funded PIs
 - CTB Director is leading MAPP Climate Model Development Task Force with a focus on NCEP/CFSv3 development in 2014–2016
 - MAPP-CTB PIs are currently involved in the Drought Task Force and Climate Prediction Task Force
- Monthly MAPP webinars (i.e., this one) engaging NCEP scientists together with external community
- Journal special collections and workshops
 - CTB and MAPP led the organization of the Special CFSv2 Collection in *Climate Dynamics* (23 articles)
 - The Drought Task Force organized a Special Issue in J of Hydrometeorology on drought understanding, monitoring and prediction
 - MAPP and CTB have co-organized several workshops



Take Home Messages



- Significant NOAA mission drivers exist for Climate Test Bed work
- An efficient Climate Test Bed process is in place for effective transition (conditional on resources)
- NOAA looks forward to your ideas and engagement!



Contact Information



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